

SEQUENCE LISTING

<110> NIPPON SHOKUBAI CO., LTD.

<120> Method for producing 1,3-propanediol and 3-hydroxypropionic acid

<130> PH-2376-PCT

<150> JP 2004-093417

<151> 2004-03-26

<150> JP 2004-124524

<151> 2004-04-20

<160> 75

<170> PatentIn version 3.1

<210> 1

<211> 558

<212> PRT

<213> Lactobacillus reuteri

<400> 1

Met Lys Arg Gln Lys Arg Phe Glu Glu Leu Glu Lys Arg Pro Ile His
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Gln Asp Thr Phe Val Lys Glu Trp Pro Glu Glu Gly Phe Val Ala Met
20 25 30

Met Gly Pro Asn Asp Pro Lys Pro Ser Val Lys Val Glu Asn Gly Lys
35 40 45

Ile Val Glu Met Asp Gly Lys Lys Leu Glu Asp Phe Asp Leu Ile Asp
50 55 60

Leu Tyr Ile Ala Lys Tyr Gly Ile Asn Ile Asp Asn Val Glu Lys Val
65 70 75 80

Met Asn Met Asp Ser Thr Lys Ile Ala Arg Met Leu Val Asp Pro Asn
85 90 95

Val Ser Arg Asp Glu Ile Ile Glu Ile Thr Ser Ala Leu Thr Pro Ala

100	105	110
Lys Ala Glu Glu Ile Ile Ser	Lys Leu Asp Phe Gly	Glu Met Ile Met
115	120	125
Ala Val Lys Lys Met Arg Pro Arg Arg Lys Pro Asp Asn Gln Cys His		
130	135	140
Val Thr Asn Thr Val Asp Asn Pro Val Gln Ile Ala Ala Asp Ala Ala		
145	150	155 160
Asp Ala Ala Leu Arg Gly Phe Pro Glu Gln Glu Thr Thr Thr Ala Val		
165	170	175
Ala Arg Tyr Ala Pro Phe Asn Ala Ile Ser Ile Leu Ile Gly Ala Gln		
180	185	190
Thr Gly Arg Pro Gly Val Leu Thr Gln Cys Ser Val Glu Glu Ala Thr		
195	200	205
Glu Leu Gln Leu Gly Met Arg Gly Phe Thr Ala Tyr Ala Glu Thr Ile		
210	215	220
Ser Val Tyr Gly Thr Asp Arg Val Phe Thr Asp Gly Asp Asp Thr Pro		
225	230	235 240
Trp Ser Lys Gly Phe Leu Ala Ser Cys Tyr Ala Ser Arg Gly Leu Lys		
245	250	255
Met Arg Phe Thr Ser Gly Ala Gly Ser Glu Val Leu Met Gly Tyr Pro		
260	265	270
Glu Gly Lys Ser Met Leu Tyr Leu Glu Ala Arg Cys Ile Leu Leu Thr		
275	280	285
Lys Ala Ser Gly Val Gln Gly Leu Gln Asn Gly Ala Val Ser Cys Ile		
290	295	300

Glu Ile Pro Gly Ala Val Pro Asn Gly Ile Arg Glu Val Leu Gly Glu
305 310 315 320

Asn Leu Leu Cys Met Met Cys Asp Ile Glu Cys Ala Ser Gly Cys Asp
325 330 335

Gln Ala Tyr Ser His Ser Asp Met Arg Arg Thr Glu Arg Phe Ile Gly
340 345 350

Gln Phe Ile Ala Gly Thr Asp Tyr Ile Asn Ser Gly Tyr Ser Ser Thr
355 360 365

Pro Asn Tyr Asp Asn Thr Phe Ala Gly Ser Asn Thr Asp Ala Met Asp
370 375 380

Tyr Asp Asp Met Tyr Val Met Glu Arg Asp Leu Gly Gln Tyr Tyr Gly
385 390 395 400

Ile His Pro Val Lys Glu Glu Thr Ile Ile Lys Ala Arg Asn Lys Ala
405 410 415

Ala Lys Ala Leu Gln Ala Val Phe Glu Asp Leu Gly Leu Pro Lys Ile
420 425 430

Thr Asp Glu Glu Val Glu Ala Ala Thr Tyr Ala Asn Thr His Asp Asp
435 440 445

Met Pro Lys Arg Asp Met Val Ala Asp Met Lys Ala Ala Gln Asp Met
450 455 460

Met Asp Arg Gly Ile Thr Ala Ile Asp Ile Ile Lys Ala Leu Tyr Asn
465 470 475 480

His Gly Phe Lys Asp Val Ala Glu Ala Ile Leu Asn Leu Gln Lys Gln
485 490 495

Lys Val Val Gly Asp Tyr Leu Gln Thr Ser Ser Ile Phe Asp Lys Asp

500	505	510
Trp Asn Val Thr Ser Ala Val	Asn Asp Gly Asn Asp Tyr Gln Gly Pro	
515	520	525
Gly Thr Gly Tyr Arg Leu Tyr Glu Asp Lys Glu Glu Trp Asp Arg Ile		
530	535	540
Lys Asp Leu Pro Phe Ala Leu Asp Pro Glu His Leu Glu Leu		
545	550	555

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 <212> DNA
 <213> Lactobacillus reuteri

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 agtgtaaaag ttgaaaatgg caagatcgta gagatggatg gtaaaaagct cgaagatttt 180
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 aaccagtgtc acgttaccaa tactgttgat aaccagttc aaattgctgc tgatgctgct 480
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 gacggaaatg attatcaagg accaggtact ggataccgtc tatatgaaga caaggaagaa 1620
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<210> 3
 <211> 558
 <212> PRT
 <213> Lactobacillus reuteri

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Gln Asp Thr Phe Val Lys Glu Trp Pro Glu Glu Gly Phe Val Ala Met
 20 25 30

Met Gly Pro Asn Asp Pro Lys Pro Ser Val Lys Val Glu Asn Gly Lys
 35 40 45

Ile Val Glu Met Asp Gly Lys Lys Arg Glu Asp Phe Asp Leu Ile Asp
 50 55 60

Leu Tyr Ile Ala Lys Tyr Gly Ile Asn Ile Asp Asn Val Glu Lys Val
65 70 75 80

Met Asn Met Asp Ser Thr Lys Ile Ala Arg Met Leu Val Asp Pro Asn
85 90 95

Val Ser Arg Glu Ser Ile Ile Glu Ile Thr Ser Ala Leu Thr Pro Ala
100 105 110

Lys Ala Glu Glu Ile Ile Ser Lys Leu Asp Phe Gly Glu Met Ile Met
115 120 125

Ala Ile Lys Lys Met Arg Pro Arg Arg Lys Pro Asp Asn Gln Cys His
130 135 140

Val Thr Asn Thr Val Asp Asn Pro Val Gln Ile Ala Ala Asp Ala Ala
145 150 155 160

Asp Ala Ala Leu Arg Gly Phe Pro Glu Gln Glu Thr Thr Thr Ala Val
165 170 175

Ala Arg Tyr Ala Pro Phe Asn Ala Ile Ser Ile Leu Ile Gly Ala Gln
180 185 190

Thr Gly Arg Pro Gly Val Leu Thr Gln Cys Ser Val Glu Glu Ala Thr
195 200 205

Glu Leu Gln Leu Gly Met Arg Gly Phe Thr Ala Tyr Ala Glu Thr Ile
210 215 220

Ser Val Tyr Gly Thr Asp Arg Val Phe Thr Asp Gly Asp Asp Thr Pro
225 230 235 240

Trp Ser Lys Gly Phe Leu Ala Ser Cys Tyr Ala Ser Arg Gly Leu Lys
245 250 255

Met Arg Phe Thr Ser Gly Ala Gly Ser Glu Val Leu Met Gly Tyr Pro

260	265	270
Glu Gly Lys Ser Met Leu Tyr	Leu Glu Ala Arg Cys Ile	Leu Leu Thr
275	280	285
Lys Ala Ser Gly Val Gln Gly	Leu Gln Asn Gly Ala Val	Ser Cys Ile
290	295	300
Glu Ile Pro Gly Ala Val Pro	Asn Gly Ile Arg Glu Val	Leu Gly Glu
305	310	315 320
Asn Leu Leu Cys Met Met Cys	Asp Ile Glu Cys Ala Ser	Gly Cys Asp
325	330	335
Gln Ala Tyr Ser His Ser Asp	Met Arg Arg Thr Glu Arg	Phe Ile Gly
340	345	350
Gln Phe Ile Ala Gly Thr Asp	Tyr Ile Asn Ser Gly Tyr	Ser Ser Thr
355	360	365
Pro Asn Tyr Asp Asn Thr Phe	Ala Gly Ser Asn Thr Asp	Ala Met Asp
370	375	380
Tyr Asp Asp Met Tyr Val Met	Glu Arg Asp Leu Gly Gln Tyr	Tyr Gly
385	390	395 400
Ile His Pro Val Gln Glu Glu	Thr Ile Ile Lys Ala Arg	Asn Lys Ala
405	410	415
Ala Lys Ala Leu Gln Ala Val	Phe Glu Asp Leu Gly Leu	Pro Lys Ile
420	425	430
Thr Asp Glu Glu Val Glu Ala	Ala Thr Tyr Ala Asn Thr	His Asp Asp
435	440	445
Met Pro Lys Arg Asp Met Val	Ala Asp Met Lys Ala Ala	Gln Asp Met
450	455	460

Met Asp Arg Gly Ile Thr Ala Ile Asp Ile Ile Lys Ala Leu Tyr Asn
 465 470 475 480

His Gly Phe Lys Asp Val Ala Glu Ala Val Leu Asn Leu Gln Lys Gln
 485 490 495

Lys Val Val Gly Asp Tyr Leu Gln Thr Ser Ser Ile Phe Asp Lys Asp
 500 505 510

Trp Asn Ile Thr Ser Ala Val Asn Asp Gly Asn Asp Tyr Gln Gly Pro
 515 520 525

Gly Thr Gly Tyr Arg Leu Tyr Glu Asp Lys Glu Glu Trp Asp Arg Ile
 530 535 540

Lys Asp Leu Pro Phe Ala Leu Asp Pro Glu His Leu Glu Leu
 545 550 555

<210> 4
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 <212> DNA
 <213> Lactobacillus reuteri

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 agtgtaaagg ttgaaaacgg taaaattgtc gaaatggatg gcaagaagcg ggaagacttt 180
 gacttaattg acctctacat tgctaagtat ggaattaata ttgataacgt tgaaaaagtt 240
 atgaatatgg attcaactaa aattgcacgg atgttggttg atccaaatgt ctcacgtgaa 300
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 aaccaatgtc acgttaccaa cacggttgat aaccagttc aaattgctgc tgatgctgct 480
 gatgctgcgc ttcgtggttt cccagaacaa gaaactacta ctgccgttgc ccgttatgca 540
 ccatttaatg ctatttcaat cttaattggt gctcaaacag gtcgtcctgg tgtattaaca 600

caatgttctg ttgaagaagc aaccgaattg caattaggaa tgcgtggctt taccgcttat 660
 gctgaaacta tttcagttta tggactgac cgggtattta ctgatggtga tgatacacca 720
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 gctcaagata tgatggatcg tggcattact gctattgata ttattaaggc tctttataac 1440
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 gattaccttc aaacttcatc aatctttgac aaggattgga atatcacttc tgccgtaaat 1560
 gacgggaatg actaccaagg tccaggtact ggataccgtc tatatgaaga caaggaagaa 1620
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<211> 236

<212> PRT

<213> *Lactobacillus reuteri*

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Asn Asp Ser Thr Ala Thr Ala Thr Gln Glu Val Gln Gln Pro Asn Ser		
35	40	45
Lys Ala Val Pro Glu Lys Lys Leu Asp Trp Phe Gln Pro Val Gly Glu		
50	55	60
Ala Lys Pro Gly Tyr Ser Lys Asp Glu Val Val Ile Ala Val Gly Pro		
65	70	75
80		
Ala Phe Ala Thr Val Leu Asp Lys Thr Glu Thr Gly Ile Pro His Lys		
85	90	95
Glu Val Leu Arg Gln Val Ile Ala Gly Ile Glu Glu Glu Gly Leu Lys		
100	105	110
Ala Arg Val Val Lys Val Tyr Arg Ser Ser Asp Val Ala Phe Cys Ala		
115	120	125
Val Gln Gly Asp His Leu Ser Gly Ser Gly Ile Ala Ile Gly Ile Gln		
130	135	140
Ser Lys Gly Thr Thr Val Ile His Gln Lys Asp Gln Asp Pro Leu Gly		
145	150	155
160		
Asn Leu Glu Leu Phe Pro Gln Ala Pro Val Leu Thr Pro Glu Thr Tyr		
165	170	175
Arg Ala Ile Gly Lys Asn Ala Ala Met Tyr Ala Lys Gly Glu Ser Pro		
180	185	190
Glu Pro Val Pro Ala Lys Asn Asp Gln Leu Ala Arg Ile His Tyr Gln		
195	200	205
Ala Ile Ser Ala Ile Met His Ile Arg Glu Thr His Gln Val Val Val		
210	215	220

Gly Lys Pro Glu Glu Glu Ile Lys Val Thr Phe Asp
 225 230 235

<210> 6
 <211> 711
 <212> DNA
 <213> Lactobacillus reuteri

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 caagaggatgc aacaacaaaa tagtaaagct gttccagaaa agaaacttga ctggttccaa 180
 ccagttggag aagcaaaacc tggatattct aaggatgaag ttgtaattgc agtcggctct 240
 gcattcgcaa ctgttcttga taagacagaa actggtattc ctcataaaga agtgcttcgt 300
 caagttattg ctggtattga agaagaaggg ctttaaggcgc gggtagttaa agtttaccgg 360
 agttcagatg tagcattctg tgctgtccaa ggtgatcacc tttctggttc aggaattgct 420
 attggtatcc aatcaaaagg gacgacagtt attcaccaaa aggatcaaga ccctcttggt 480
 aaccttgagt tattccaca agcgccagta cttactcccg aaacttatcg tgcaattggt 540
 aagaatgccg ctatgtatgc taagggtgaa tctccagaac cagttccagc taaaaacgat 600
 caacttgctc gtattcacta tcaagctatt tcagcaatta tgcattatcg tgaaactcac 660
 caagttgttg ttgtaagcc tgaagaagaa attaaggta cgtttgatta a 711

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 <212> PRT
 <213> Lactobacillus reuteri

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Leu Asn Glu Thr Asn Gln Ile Asp Thr Lys Ile Asn Phe Asp Lys Glu
 20 25 30

Asn Asn Ser Thr Ala Thr Ala Thr Glu Glu Val Gln Gln Pro Asn Ser
35 40 45

Lys Ala Val Pro Glu Lys Lys Leu Asp Trp Phe Gln Pro Ile Gly Glu
50 55 60

Ala Lys Pro Gly Tyr Ser Lys Asp Glu Val Val Ile Ala Val Gly Pro
65 70 75 80

Ala Phe Ala Thr Val Leu Asp Lys Thr Glu Thr Gly Ile Pro His Lys
85 90 95

Glu Val Leu Arg Gln Val Ile Ala Gly Ile Glu Glu Glu Gly Leu Lys
100 105 110

Ala Arg Val Val Lys Val Tyr Arg Ser Ser Asp Val Ala Phe Cys Ala
115 120 125

Val Gln Gly Asp His Leu Ser Gly Ser Gly Ile Ala Ile Gly Ile Gln
130 135 140

Ser Lys Gly Thr Thr Val Ile His Gln Lys Asp Gln Asp Pro Leu Gly
145 150 155 160

Asn Leu Glu Leu Phe Pro Gln Ala Pro Val Leu Thr Pro Glu Thr Phe
165 170 175

Arg Ala Ile Gly Lys Asn Ala Ala Met Tyr Ala Lys Gly Glu Ser Pro
180 185 190

Glu Pro Val Pro Ala Lys Asn Asp Gln Leu Ala Arg Ile His Tyr Gln
195 200 205

Ala Ile Ser Ala Ile Met His Ile Arg Glu Thr His Gln Val Val Val
210 215 220

Gly Lys Pro Glu Glu Glu Ile Lys Val Thr Phe Asp

225

230

235

<210> 8

<211> 711

<212> DNA

<213> *Lactobacillus reuteri*

<400> 8

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gaagaagttc aacaacccaa cagcaaggca gttcctgaaa agaaacttga ttggttccaa    180
ccaattggcg aagcaaaacc aggttactca aaggatgaag ttgtaatcgc agttggtcct    240
gcctttgcaa cagttctaga taaaacagaa actgggattc ctcataaaga ggtacttcgt    300
caagtaattg ccggaattga agaagaggga cttaaagcac gagtagttaa agtctatcgt    360
tcatacagcg ttgctttctg tgctgttcag ggtgaccact tatctggttc aggaattgca    420
attggaatcc aatctaaggg aacaactgtt attcaccaaa aagaccagga tccattagga    480
aacctagaat tattccaca agctccggtt ctacaccag aaactttccg ggcaattggt    540
aagaatgcag caatgtacgc taaagtgaa tctccagaac cagttccagc taagaacgat    600
caacttgctc gtattcacta ccaagctatt tcagcaatta tgcatattcg tgaaactcac    660
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<212> PRT

<213> *Lactobacillus reuteri*

<400> 9

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Gly Asn Ser Ser Ser Ala Asn Ser Ser Thr Gly Thr Ser Thr Ala Ser
20          25          30

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Thr Ser Lys Glu Met Thr Ala Asp Asp Tyr Pro Leu Tyr Gln Lys His

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35	40	45
Arg Asp Leu Val Lys Thr	Pro Lys Gly His Asn Leu	Asp Asp Ile Asn
50	55	60
Leu Gln Lys Val Val Asn Asn Gln Val Asp	Pro Lys Glu Leu Arg Ile	
65	70	75 80
Thr Pro Glu Ala Leu Lys Leu Gln Gly Glu Ile Ala Ala Asn Ala Gly		
	85	90 95
Arg Pro Ala Ile Gln Lys Asn Leu Gln Arg Ala Ala Glu Leu Thr Arg		
100	105	110
Val Pro Asp Glu Arg Val Leu Glu Met Tyr Asp Ala Leu Arg Pro Phe		
115	120	125
Arg Ser Thr Lys Gln Glu Leu Leu Asn Ile Ala Lys Glu Leu Arg Asp		
130	135	140
Lys Tyr Asp Ala Asn Val Cys Ala Ala Trp Phe Glu Glu Ala Ala Asp		
145	150	155 160
Tyr Tyr Glu Ser Arg Lys Lys Leu Lys Gly Asp Asn		
165	170	

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 <212> DNA
 <213> Lactobacillus reuteri

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gattaccac tttatcaaaa gcaccgtgat ttagtaaaaa caccaaaaagg acacaatctt	180
gatgacatca atttacaaaa agtagtaaat aatcaagttg atcctaagga attacggatt	240
acaccagaag cattgaaact tcaagtgaa attgcagcta atgctggccg tccagctatt	300

caaaagaatc ttcaacgagc tgcagaattia acacgagtac ctgacgaacg ggttcttgaa 360
atgtatgatg cattgcgtcc tticcgttca actaagcaag aattattgaa cattgcaaag 420
gaattacggg acaagtatga cgctaagtgt tgcgcagcat ggttgaaga agctgctgat 480
tattatgaaa gtcgtaagaa gctaaagggc gataactaa 519

<210> 11
<211> 171
<212> PRT
<213> Lactobacillus reuteri

<400> 11

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Gly Lys Glu Met Thr Ala Asp Asp Tyr Pro Leu Tyr Gln Lys His Arg
35 40 45

Asp Leu Val Lys Thr Pro Ser Gly Lys Lys Leu Asp Asp Ile Thr Leu
50 55 60

Gln Lys Val Val Asn Asp Gln Val Asp Pro Lys Glu Leu Arg Ile Thr
65 70 75 80

Pro Glu Ala Leu Lys Leu Gln Gly Glu Ile Ala Ala Asn Ala Gly Arg
85 90 95

Pro Ala Ile Gln Lys Asn Leu Gln Arg Ala Ala Glu Leu Thr Arg Val
100 105 110

Pro Asp Glu Arg Val Leu Gln Met Tyr Asp Ala Leu Arg Pro Phe Arg
115 120 125

Ser Thr Lys Gln Glu Leu Leu Asp Ile Ala Asn Glu Leu Arg Asp Lys

130

135

140

Tyr His Ala Glu Val Cys Ala Ala Trp Phe Glu Glu Ala Ala Asn Tyr
 145 150 155 160

Tyr Glu Ser Arg Lys Lys Leu Lys Gly Asp Asn
 165 170

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 <212> DNA
 <213> Lactobacillus reuteri

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 tatcctcttt accaaaagca ccgtgattta gtaaagacac catcaggaaa gaaacttgat 180
 gatattactt tacaaaaggt tgtaaagat caagttgato caaaagaatt acggattact 240
 ccagaagcat taaaacttca aggtgagatc gcagcaaacg ctggtcggcc agcaattcaa 300
 aagaacttac aacgggcagc tgaattaaca cgtgttcag acgaacgtgt tttgcaaatg 360
 tatgatgcat tacggccatt ccgttcaacg aagcaagaat tactagatat tgctaatgaa 420
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 tatgaaagtc gaaagaagct caagggtgat aactag 516

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 <212> PRT
 <213> Lactobacillus reuteri

<400> 13

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 20 25 30

Arg Ile Leu Leu Val Cys Asp Ser Phe Leu Pro Gly Ser Asp Thr Leu
35 40 45

Lys Glu Ile Glu Ser His Ile Lys Asp Asn Asn Lys Cys Glu Ile Phe
50 55 60

Ser Asp Val Val Pro Asp Pro Pro Leu Asp Lys Ile Met Glu Gly Val
65 70 75 80

Gln Gln Phe Leu Lys Leu Lys Pro Thr Ile Val Ile Gly Ile Gly Gly
85 90 95

Gly Ser Ala Leu Asp Thr Gly Lys Gly Ile Arg Phe Phe Gly Glu Lys
100 105 110

Leu Gly Lys Cys Lys Ile Asn Glu Tyr Ile Ala Ile Pro Thr Thr Ser
115 120 125

Gly Thr Gly Ser Glu Val Thr Asn Thr Ala Val Ile Ser Asp Thr Lys
130 135 140

Glu His Arg Lys Ile Pro Ile Leu Glu Asp Tyr Leu Thr Pro Asp Cys
145 150 155 160

Ala Leu Leu Asp Pro Lys Leu Val Met Thr Ala Pro Lys Ser Val Thr
165 170 175

Ala Tyr Ser Gly Met Asp Val Leu Thr His Ala Leu Glu Ser Leu Val
180 185 190

Ala Lys Asp Ala Asn Leu Phe Thr Val Ala Leu Ser Glu Glu Ala Ile
195 200 205

Asp Ala Val Ile Lys His Leu Val Glu Cys Tyr Arg His Gly Asp Asn
210 215 220

Val Asp Ala Arg Lys Ile Val His Glu Ala Ser Asn Ile Ala Gly Thr

225 230 235 240

Ala Phe Asn Ile Ala Gly Leu Gly Ile Cys His Ser Ile Ala His Gln
 245 250 255

Leu Gly Ala Asn Phe His Val Pro His Gly Leu Ala Asn Thr Met Leu
 260 265 270

Leu Pro Tyr Val Ile Ala Tyr Asn Ala Glu His Ser Glu Glu Ala Leu
 275 280 285

His Lys Phe Ala Ile Ala Ala Lys Lys Ala Gly Ile Ala Ala Pro Gly
 290 295 300

Val Gly Asp Arg Leu Ala Val Lys Arg Leu Ile Ala Lys Ile Arg Glu
 305 310 315 320

Met Ala Arg Gln Met Asn Cys Pro Met Thr Leu Gln Ala Phe Gly Val
 325 330 335

Asp Pro Ala Lys Ala Glu Glu Leu Ala Asp Thr Val Val Ala Asn Ala
 340 345 350

Lys Lys Asp Ala Thr Phe Pro Gly Asn Pro Val Val Pro Ser Asp Asn
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 370 375

<210> 14
 <211> 1140
 <212> DNA
 <213> Lactobacillus reuteri

<400> 14
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 gatagtttga aagaactaga gacacttaat aatgaacgta ttttattagt ctgtgattct 120
 ttcttgccctg gtagtgatac cttaaaagaa attgagagtc acattaagga taataataag 180

tgtgaaattt tctctgatgt tgtcccgat cctccactag ataagattat ggaaggggtt 240
 caacaattcc ttaaacttaa accaacaatt gtgattgta tcggtggcgg atcagctttg 300
 gatactggta agggaattcg tttctttggt gaaaagttgg gcaagtcaa gatcaatgaa 360
 tatattgcta ttccaacaac gagggtgact ggttcagaag ttacgaatac tgcggttatt 420
 tctgatacga aagaacatcg taaaattcct attttgggaag attatttgac acctgattgt 480
 gctttactag atcctaaact agttatgact gctcctaaga gtgtaactgc atattcagga 540
 atggatgttt taacacatgc acttgaatct ttggttgcta aggatgcaaa tttattcaca 600
 gttgcattat cagaagaagc aattgatgcc gttattaaac atttagttga gtgttatcgt 660
 cacggcgata atgtggatgc tcgtaagatt gttcatgaag catcaaatac tgccggaact 720
 gcatttaata ttgctggatt agggatttgc cactcaattg cgcataatt gggagctaata 780
 ttccacgttc cccatggttt agcaaataca atgctcttgc catatgttat cgcataata 840
 gctgaacata gtgaagagga attgcataag ttgcaattg ctgctaagaa agctggaatt 900
 gctgctcctg gagtaggcga tcgtcttgca gtaaagcgac taattgctaa aattagggaa 960
 atggcacgac aatgaattg tccaatgact cttcaagcat tcggtgttga tcctgctaaa 1020
 gctgaagaat tagctgatac tgttgttgca aatgcgaaga aagatgcaac attccctggc 1080
 aatccagttg ttcttcaga taatgatctg aagatggttt acgaagcaat aattcgtaa 1140

<210> 15
 <211> 379
 <212> PRT
 <213> Lactobacillus reuteri

<400> 15

Met Gly Gly Ile Met Pro Met Glu Lys Phe Ser Met Pro Thr Arg Ile
 1 5 10 15

Tyr Ser Gly Thr Asp Ser Leu Lys Glu Leu Glu Thr Leu His Asn Glu
 20 25 30

Arg Ile Leu Leu Val Cys Asp Ser Phe Leu Pro Gly Ser Asp Thr Leu

35	40	45
Lys Glu Ile Glu Ser His Ile Asn Asp Ser Asn Lys Cys Glu Ile Phe		
50	55	60
Ser Asp Val Val Pro Asp Pro Pro Leu Asp Lys Ile Met Glu Gly Val		
65	70	75 80
Gln Gln Phe Leu Lys Leu Lys Pro Thr Ile Val Ile Gly Ile Gly Gly		
	85	90 95
Gly Ser Ala Met Asp Thr Gly Lys Gly Ile Arg Phe Phe Gly Glu Lys		
	100	105 110
Leu Gly Lys Cys Lys Ile Asn Glu Tyr Ile Ala Ile Pro Thr Thr Ser		
	115	120 125
Gly Thr Gly Ser Glu Val Thr Asn Thr Ala Val Ile Ser Asp Thr Lys		
	130	135 140
Glu His Arg Lys Ile Pro Ile Leu Glu Asp Tyr Leu Thr Pro Asp Cys		
145	150	155 160
Ala Leu Leu Asp Pro Lys Leu Val Met Thr Ala Pro Lys Ser Val Thr		
	165	170 175
Ala Tyr Ser Gly Met Asp Val Leu Thr His Ala Leu Glu Ser Leu Val		
	180	185 190
Ala Lys Asp Ala Asn Leu Phe Thr Val Ala Leu Ser Glu Glu Ala Ile		
	195	200 205
Asp Ala Val Thr Lys Tyr Leu Val Glu Cys Tyr Arg His Gly Asp Asn		
	210	215 220
Val Asp Ala Arg Lys Ile Val His Glu Ala Ser Asn Ile Ala Gly Thr		
225	230	235 240

Ala Phe Asn Ile Ala Gly Leu Gly Ile Cys His Ser Ile Ala His Gln
245 250 255

Leu Gly Ala Asn Phe His Val Pro His Gly Leu Ala Asn Thr Met Leu
260 265 270

Leu Pro Tyr Val Val Ala Tyr Asn Ala Glu His Cys Glu Glu Ala Leu
275 280 285

His Lys Phe Ala Ile Ala Ala Lys Lys Ala Gly Ile Ala Ala Pro Gly
290 295 300

Val Gly Asp Arg Leu Ala Val Lys Arg Leu Ile Ala Lys Ile Arg Glu
305 310 315 320

Met Ala Arg Gln Met Asn Cys Pro Met Thr Leu Gln Ala Phe Gly Val
325 330 335

Asp His Ala Lys Ala Glu Ala Ala Ala Asp Thr Val Val Ala Asn Ala
340 345 350

Lys Lys Asp Ala Thr Phe Pro Gly Asn Pro Val Val Pro Ser Asp Asp
355 360 365

Asp Leu Lys Met Ile Tyr Glu Ala Ile Ile Arg
370 375

<210> 16
<211> 1140
<212> DNA
<213> Lactobacillus reuteri

<400> 16
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ttcttacctg gtagtgacac attaaaggaa attgagagtc atattaacga cagtaataaa 180
tgtgaaattt tctctgatgt tgtccctgat ccaccactag ataaaattat ggaaggggtt 240

caacagtict taaagctgaa accaacaatt gtaattggta tcggtggtgg ttctgcaatg 300
 gacaccggta aggaatttcg tttcttcggt gaaaagcttg gcaagtgcaa aattaatgaa 360
 tatattgcaa ttccaacaac cagcggaacc ggttcagaag ttactaatac tgcggttatt 420
 tctgatacta aggaacaccg gaagattccg attcttgaag attacttaac accagattgt 480
 gcattgcttg atcctaagtt agtaatgaca gcaccaaaga gtgttactgc ctactcagga 540
 atggatgtat taactcatgc tcttgaatca ttggttgcta aggacgctaa tttgtttacc 600
 gttgcattat cagaagaagc cattgatgog gtaactaagt atcttgttga atgttatcgt 660
 catggcgata atgtcgatgc acgaaagatc gttcacgaag catcaaatac tgccggaaca 720
 gcctttaaca ttgctggact aggtatttgc cactcaattg cccaccaatt aggtgctaac 780
 ttccatgttc ctcatggttt agcaaacaca atgttattgc catatgttgt tgcatacaat 840
 gctgaacact gtgaagaagc cttacacaag ttgcaattg ccgctaagaa agccggaatt 900
 gctgcacctg gcgttggatga ccgtttggct gttaaagcggc tgattgcaaa gattcgtgaa 960
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 gcagaagcag ctgctgatac ggttgttgct aatgcgaaga aggatgcaac attcccaggc 1080
 aatccagttg ttccttcaga tgatgatctg aagatgattt acgaagcaat aattcgtaa 1140

<210> 17
 <211> 390
 <212> PRT
 <213> Lactobacillus reuteri

<400> 17

Met Asn Arg Gln Phe Asp Phe Leu Met Pro Ser Val Asn Phe Phe Gly
 1 5 10 15

Pro Gly Val Ile Ala Lys Ile Gly Asp Arg Ala Lys Met Leu Asn Met
 20 25 30

His Lys Pro Leu Ile Val Thr Thr Glu Gly Leu Ser Lys Ile Asp Asn
 35 40 45

Gly Pro Val Lys Gln Thr Val Ala Ser Leu Glu Lys Ala Gly Val Asp
50 55 60

Tyr Ala Val Phe Thr Gly Ala Glu Pro Asn Pro Lys Ile Arg Asn Val
65 70 75 80

Gln Ala Gly Lys Lys Met Tyr Gln Asp Glu Asn Cys Asp Ser Ile Ile
85 90 95

Thr Val Gly Gly Gly Ser Ala His Asp Cys Gly Lys Gly Ile Gly Ile
100 105 110

Val Leu Thr Asn Gly Asp Asp Ile Ser Lys Leu Ala Gly Ile Glu Thr
115 120 125

Leu Lys Asn Pro Leu Pro Pro Leu Met Ala Val Asn Thr Thr Ala Gly
130 135 140

Thr Gly Ser Glu Leu Thr Arg His Ala Val Ile Thr Asn Glu Lys Thr
145 150 155 160

His Leu Lys Phe Val Val Val Ser Trp Arg Asn Ile Pro Leu Val Ser
165 170 175

Phe Asn Asp Pro Met Leu Met Leu Asp Ile Pro Lys Asp Ile Thr Ala
180 185 190

Ala Thr Gly Cys Asp Ala Phe Val Gln Ala Ile Glu Pro Tyr Val Ser
195 200 205

Val Asp His Asn Pro Ile Thr Asp Ser Gln Cys Lys Glu Ala Ile Gln
210 215 220

Leu Ile Gln Thr Ala Leu Pro Glu Val Val Ala Asn Gly His Asn Ile
225 230 235 240

Glu Ala Arg Thr Lys Met Val Glu Ala Glu Met Leu Ala Gly Met Ala

	245		250		255
Phe Asn Asn Ala Asn Leu Gly Tyr Val His Ala Met Ala His Gln Leu					
	260		265		270
Gly Gly Gln Tyr Asp Ala Pro His Gly Val Cys Cys Ala Leu Leu Leu					
	275		280		285
Thr Thr Val Glu Glu Tyr Asn Leu Ile Ala Cys Pro Glu Arg Phe Ala					
	290		295		300
Glu Leu Ala Lys Val Met Gly Phe Asp Thr Thr Gly Leu Thr Leu Tyr					
305		310		315	320
Glu Ala Ala Gln Lys Ser Ile Asp Gly Met Arg Glu Met Cys Arg Leu					
	325		330		335
Val Gly Ile Pro Ser Ser Ile Lys Glu Ile Gly Ala Lys Pro Glu Asp					
	340		345		350
Phe Glu Met Met Ala Lys Asn Ala Leu Lys Asp Gly Asn Ala Phe Ser					
	355		360		365
Asn Pro Arg Lys Gly Thr Val Glu Asp Ile Val Lys Leu Tyr Gln Lys					
	370		375		380
Ala Tyr Asp Gly Ile Tyr					
385		390			

<210> 18
 <211> 1173
 <212> DNA
 <213> Lactobacillus reuteri

<400> 18	
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gaaggtttat ccaagattga caatggtcct gtaaagcaaa ccgttgcttc attggaaaag	180

gctggcgttg actatgccgt atttactggc gctgaaccta accctaagat ccggaatggt 240
 caagctggta aaaagatgta ccaagatgaa aactgtgact caattattac tgttgggtggg 300
 ggttctgctc acgactgtgg taagggtatc ggtattgttt taactaacgg tgatgacatt 360
 tccaagcttg ccggaatiga aacattgaag aatccacttc caccattgat ggctgttaac 420
 actactgccg gaactggttc tgaattaact cgtcacgctg ttattactaa cgaaaagact 480
 catttgaagt ttgttgttgt ttcattggcg aacattccat tggatcatt caacgatcca 540
 atgttgatgc ttgatattcc aaaagacatt accgctgcta ctggttgtga tgcttttgtt 600
 caggctattg aaccatacgt ttctgttgac cataacccaa ttactgatag tcaatgtaaa 660
 gaagctattc aattaattca aactgcttta ccagaagtag ttgctaattg tcacaatatt 720
 gaagcacgga ctaagatggt tgaagctgaa atgcttgccg gaatggcctt caataatgcc 780
 aacttaggct atgttcacgc aatggctcac caactcgggt gtcaatatga tgctcctcat 840
 ggtgtttgct gtgccttgct ctgaccact gttgaagaat ataacttaac cgcatgtcca 900
 gagcggtttg ctgaattggc taaggtaatg ggctttgaca ctactggtct taccctttac 960
 gaagcagcac aaaagtcaat tgacggtatg cgtgaaatgt gccggccttg ttgtattcca 1020
 tcatcaatca aggaaatigg tgctaagcca gaagactttg aaatgatggc caagaatgcc 1080
 ctcaaggatg gtaatgcctt ctctaaccac cgtgaaggta ctgttgaaga tattgtaaag 1140
 ctttatcaaa aggcttacga tggcatctac taa 1173

<210> 19
 <211> 616
 <212> PRT
 <213> Lactobacillus reuteri

<400> 19

Met Ala Thr Glu Lys Val Ile Gly Val Asp Ile Gly Asn Ser Ser Thr
 1 5 10 15

Glu Val Ala Leu Ala Asp Val Ser Asp Ser Gly Gln Val His Phe Ile
 20 25 30

Asn Ser Gly Ile Ala Pro Thr Thr Gly Ile Lys Gly Thr Lys Gln Asn
35 40 45

Leu Val Gly Ile Arg Asp Ser Ile Thr Gln Val Leu Asn Lys Ser Asn
50 55 60

Leu Thr Ile Asp Asp Ile Asp Leu Ile Arg Ile Asn Glu Ala Thr Pro
65 70 75 80

Val Ile Gly Asp Val Ala Met Glu Thr Ile Thr Glu Thr Val Val Thr
85 90 95

Glu Ser Thr Met Ile Gly His Asn Pro Asn Thr Pro Gly Gly Ile Gly
100 105 110

Thr Gly Ala Gly Ile Thr Val Arg Leu Leu Asp Leu Leu Lys Lys Thr
115 120 125

Asp Lys Ser Lys Asn Tyr Ile Val Val Val Pro Lys Asp Ile Asp Phe
130 135 140

Glu Asp Val Ala Lys Leu Ile Asn Ala Tyr Val Ala Ser Gly Tyr Lys
145 150 155 160

Ile Thr Ala Ala Ile Leu Arg Asn Asp Asp Gly Val Leu Val Asp Asn
165 170 175

Arg Leu Asn His Lys Ile Pro Ile Val Asp Glu Val Ala Met Ile Asp
180 185 190

Lys Val Pro Leu Asn Met Leu Ala Ala Val Glu Val Ala Gly Pro Gly
195 200 205

Gln Val Ile Ser Gln Leu Ser Asn Pro Tyr Gly Ile Ala Thr Leu Phe
210 215 220

Gly Leu Thr Pro Glu Glu Thr Lys Asn Ile Val Pro Val Ser Arg Ala

225	230	235	240
Leu Ile Gly Asn Arg Ser Ala Val Val Ile Lys Thr Pro Ala Gly Asp	245	250	255
Val Lys Ala Arg Val Ile Pro Ala Gly Lys Ile Ile Ile Asn Gly Asp	260	265	270
Thr Gly Lys Glu Glu Val Gly Val Ser Glu Gly Ala Asp Ala Ile Met	275	280	285
Lys Lys Val Ser Ser Phe Arg His Ile Asn Asn Ile Thr Gly Glu Ser	290	295	300
Gly Thr Asn Val Gly Gly Met Leu Glu Asn Val Arg Gln Thr Met Ala	305	310	315
Asp Leu Thr Gly Lys Lys Asn Asp Glu Ile Ala Ile Gln Asp Leu Leu	325	330	335
Ala Val Asp Thr Gln Val Pro Val Glu Val Arg Gly Gly Leu Ala Gly	340	345	350
Glu Phe Ser Asn Glu Ser Ala Val Gly Ile Ala Ala Met Val Lys Ser	355	360	365
Asp His Leu Gln Met Glu Val Ile Ala Lys Leu Ile Glu Lys Glu Phe	370	375	380
Asn Thr Lys Val Glu Ile Gly Gly Ala Glu Val Glu Ser Ala Ile Arg	385	390	395
Gly Ala Leu Thr Thr Pro Gly Thr Asp Lys Pro Ile Ala Ile Leu Asp	405	410	415
Leu Gly Ala Gly Ser Thr Asp Ala Ser Ile Ile Asn Lys Glu Asn Asn	420	425	430

Thr Val Ala Ile His Leu Ala Gly Ala Gly Asp Met Val Thr Met Ile
435 440 445

Ile Asn Ser Glu Leu Gly Leu Asn Asp Ile His Leu Ala Glu Asp Ile
450 455 460

Lys Arg Tyr Pro Leu Ala Lys Val Glu Asn Leu Phe Gln Ile Arg His
465 470 475 480

Glu Asp Gly Ser Val Gln Phe Phe Lys Asp Pro Leu Pro Ser Ser Leu
485 490 495

Phe Ala Lys Val Val Val Ile Lys Pro Asp Gly Tyr Glu Pro Val Thr
500 505 510

Gly Asn Pro Ser Ile Glu Lys Ile Lys Leu Val Arg Gln Ser Ala Lys
515 520 525

Lys Arg Val Phe Val Thr Asn Ala Leu Arg Ala Leu Lys Tyr Val Ser
530 535 540

Pro Thr Gly Asn Ile Arg Asp Ile Pro Phe Val Val Ile Val Gly Gly
545 550 555 560

Ser Ala Leu Asp Phe Glu Ile Pro Gln Leu Val Thr Asp Glu Leu Ala
565 570 575

His Phe Asn Leu Val Ala Gly Arg Gly Asn Val Arg Gly Val Glu Gly
580 585 590

Pro Arg Asn Ala Val Ala Thr Gly Leu Ile Leu Arg Tyr Gly Glu Glu
595 600 605

Arg Arg Lys Arg Tyr Glu Gln Arg
610 615

<210> 20

<211> 1851
<212> DNA
<213> Lactobacillus reuteri

<400> 20

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gggattaaag gtactaagca gaatctagtt ggaattaggg attcaattac tcaagtictg	180
aataaatcta atctgacaat cgatgatatt gatttaattc gaatcaatga agccacgcca	240
gtaattgggtg atgttgcaat ggaaactatt acagaaacag ttgtaacaga atcaacaatg	300
attgggcata atcctaatac accaggtggt ataggaacag gggctgggat aacagttcgt	360
ttgcttgatc tcttaaagaa aactgataaa agcaaaaatt atattgttgt agttcctaag	420
gatattgatt ttgaagacgt tgctaaactt atcaatgctt atgttgctc tggttataaa	480
ataacagcag caattctaag aaacgatgat ggtgttttag ttgataatcg gttaaactcat	540
aaaattccga ttgtcgatga agttgctatg attgacaaag ttccgttaaa tatgctggca	600
gctgtagaag ttgctggccc tggacaagta atttcacaac tttcaaacc gtatggtatc	660
gctaccttat ttggactaac tccagaagag actaagaata ttgttccagt ttctcgagcg	720
cttattggaa atcgttcggc tgttgttatt aagactccag ctggggatgt taaagcgga	780
gtaattccag caggtaaaat cataattaat ggtgatactg gaaaagaaga agttggagtt	840
tctgaagggtg ctgacgccat tatgaaaaag gtttctagtt tccgccatat taacaatata	900
actggtgagt ctggaaccaa tgttgagga atgttgaaa atgttcgtca aacaatggca	960
gatcttacag gaaagaaaaa tgatgaaatt gctattcaag atttacttgc tgttgatact	1020
caagtaccag ttgaagttcg aggcggtcta gctggtgaat tctcaaatga atcagcagtt	1080
gggatcgag caatggttaa gtcagatcat cttcaaatgg aagttattgc taaacttatt	1140
gaaaaagaat ttaatacaaa ggttgaaatt ggtggtgctg aagtigaatc tgcaattcgt	1200
ggagcattaa caactccagg aacagataag ccaatcgcaa tccttgattt aggtgctggc	1260
tcaacagatg cttcaatcat taataaagaa aataatacag ttgcaattca cttagctggt	1320
gctggtgata tggtaacgat gattattaat tctgaattag gattgaatga tattcatctt	1380

gcagaagaca tcaaacgcta cccattagca aaggtagaaa acctttttca aattcgacat 1440
gaggatgggt cggttcaatt ctttaaagat ccgcttccat catcactgtt tgccaaagtt 1500
gtagtaatta aaccagatgg atacgaacca gtaactggga atccaagcat tgaaaaaatt 1560
aaattagtgc gtcaaagtgc aaagaaacga gtatttgta cgaacgcttt acgggcactt 1620
aagtatgtta gtccaactgg aaatattcgt gatattccgt ttgttgtaat tgtcgggtgt 1680
tcagccttag actttgaaat tccacaactt gttacagatg aattagcaca ctttaattta 1740
gttgctggtc gaggaaatgt tcgtggagtt gaaggaccac gaaatgccgt tgcaactgga 1800
ttgattttaa ggtatggcga agaaagaagg aagcgttatg aacaacgatg a 1851

<210> 21
<211> 615
<212> PRT
<213> Lactobacillus reuteri

<400> 21

Met Ala Thr Glu Lys Val Ile Gly Val Asp Ile Gly Asn Ser Ser Thr
1 5 10 15

Glu Val Ala Leu Ala Asp Val Ala Asp Asn Gly Thr Ile Asn Phe Ile
20 25 30

Gly Ser Gly Ile Ala Pro Thr Thr Gly Ile Lys Gly Thr Lys Gln Asn
35 40 45

Leu Val Gly Ile Arg Asp Ser Ile Asn Gln Val Leu Asn Lys Ala Asn
50 55 60

Leu Thr Ile Asn Asp Ile Asp Leu Ile Arg Ile Asn Glu Ala Thr Pro
65 70 75 80

Val Ile Gly Asp Val Ala Met Glu Thr Ile Thr Glu Thr Val Val Thr
85 90 95

Glu Ser Thr Met Ile Gly His Asn Pro Asp Thr Pro Gly Gly Ile Gly

100	105	110
Thr Gly Ala Gly Ile Thr Val	Arg Leu Leu Asp Leu Val	Lys Lys Thr
115	120	125
Asp Lys Ser Gln Asn Tyr Ile Val Val Val Pro Lys Asp Ile Asp Phe		
130	135	140
Glu Asp Val Ala Lys Leu Ile Asn Ala Tyr Val Ala Ser Gly Tyr Lys		
145	150	155 160
Ile Thr Ala Ala Ile Leu Lys Asn Asp Asp Gly Val Leu Val Asp Asn		
165	170	175
Arg Leu Asn Lys Pro Ile Pro Ile Val Asp Glu Val Ala Met Ile Asp		
180	185	190
Lys Val Pro Leu Asn Met Leu Ala Ala Val Glu Val Ala Gly Ser Gly		
195	200	205
Gln Val Ile Ser Gln Leu Ser Asn Pro Tyr Gly Ile Ala Thr Leu Phe		
210	215	220
Gly Leu Asn Pro Glu Glu Thr Lys Asn Ile Val Pro Val Ser Arg Ala		
225	230	235 240
Leu Ile Gly Asn Arg Ser Ala Val Val Ile Lys Thr Pro Ala Gly Asp		
245	250	255
Val Lys Ala Arg Val Ile Pro Ala Gly Asn Ile Ile Ile Asn Ser Asp		
260	265	270
Thr Gly Lys Glu Glu Val Gly Val Ser Glu Gly Ala Asp Ala Ile Met		
275	280	285
Lys Lys Val Ser Ser Phe Arg His Ile Asn Asp Ile Thr Gly Glu Ser		
290	295	300

Gly Thr Asn Val Gly Gly Met Leu Glu Asn Val Arg Gln Thr Met Ala
305 310 315 320

Asp Leu Thr Gly Lys Lys Asn Ser Glu Ile Ala Ile Gln Asp Leu Leu
325 330 335

Ala Val Asp Thr Gln Val Pro Val Glu Val Arg Gly Gly Leu Ala Gly
340 345 350

Glu Phe Ser Asn Glu Ser Ala Val Gly Ile Ala Ala Met Val Lys Ser
355 360 365

Asp His Leu Gln Met Glu Val Ile Ala Lys Leu Ile Glu Asp Glu Phe
370 375 380

His Thr Lys Val Glu Ile Gly Gly Ala Glu Val Glu Ser Ala Ile Arg
385 390 395 400

Gly Ala Leu Thr Thr Pro Gly Thr Asp Lys Pro Ile Ala Ile Leu Asp
405 410 415

Leu Gly Ala Gly Ser Thr Asp Ala Ser Ile Ile Asn Lys Glu Asn Gln
420 425 430

Thr Val Ala Ile His Leu Ala Gly Ala Gly Asp Met Val Thr Met Ile
435 440 445

Ile Asn Ser Glu Leu Gly Leu Asn Asp Ile His Leu Ala Glu Asp Ile
450 455 460

Lys Arg Tyr Pro Leu Ala Lys Val Glu Asn Leu Phe Gln Ile Arg His
465 470 475 480

Glu Asp Gly Ser Val Gln Phe Phe Glu Asp Pro Leu Pro Ser Ser Leu
485 490 495

Phe Ala Arg Val Val Val Ile Lys Pro Asp Gly Tyr Glu Pro Val Thr

500	505	510
Gly Asn Pro Ser Ile Glu Lys	Ile Lys Leu Val Arg Gln Ser Ala Lys	
515	520	525
Lys Arg Val Phe Val Thr Asn Ala Leu Arg Ala Leu Lys Tyr Val Ser		
530	535	540
Pro Thr Gly Asn Ile Arg Asp Ile Pro Phe Val Val Ile Val Gly Gly		
545	550	555 560
Ser Ala Leu Asp Phe Glu Ile Pro Gln Leu Val Thr Asp Glu Leu Ala		
565	570	575
His Phe Asn Leu Val Ala Gly Arg Gly Asn Val Arg Gly Val Glu Gly		
580	585	590
Pro Arg Asn Ala Val Ala Thr Gly Leu Ile Leu Arg Tyr Gly Glu Glu		
595	600	605
Arg Arg Lys Gln Tyr Glu Gln		
610	615	

<210> 22
 <211> 1848
 <212> DNA
 <213> Lactobacillus reuteri

<400> 22
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 ggtatcaagg gtacaaaaca aaatctggtt ggaattagag attccatcaa tcaagtcctt 180
 aataaggcta atttaacgat taatgatatt gatttaattc ggattaatga ggcaacgcca 240
 gttatcggtg acgtacgat ggaaacaatt accgaaacgg tcgtaaccga atcgactatg 300
 atcggacata atcctgatac tcccggtggt attggaactg gtgcaggaat aacagttaga 360
 ctattggatc ttgtcaaaaa gacggataaa agtcaaaact atattgttgt tgttccaag 420

gatattgatt ttgaagatgt tgctaaactg attaacgcct atgttgcttc gggctataag	480
attacagctg cgatcctaaa aaatgatgat ggtgtgttag ttgataatcg attgaataaa	540
ccaattccga ttgttgatga agttgccatg attgataaag tcccattaaa tatgctggcg	600
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gctaccttgt ttggattgaa tccagaagaa accaagaata ttgttcctgt ctacagtgca	720
cttattggta accgttctgc cgttgtcatt aagacaccag caggggatgt taaggcacgg	780
gtaattccag ccggaacat tatcattaac agcgataccg gaaaagaaga agttggtgtt	840
tcagaagggt ctgacgccat tatgaagaaa gtttccagtt tccgtcacat taatgatatt	900
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gatttaactg gaaagaagaa tagtgaaatt gctattcaag atctattagc ggtagataca	1020
cagggtgcctg tcgaagtgc cgggggcttg gctggtgaat tttcaaatga atcagcagtt	1080
ggtattgctg cgatggttaa gtctgatcat ctcaaatgg aagtaattgc taaattaatt	1140
gaggatgaat tccatacgaa ggttgagatt ggtggtgccg aagttgaatc tgcaattcgc	1200
ggtgcattaa cgacaccggg aacagataaa ccaattgcaa ttcttgattt aggtgccggc	1260
tcaacagatg cttcaattat caataaagaa aatcaaactg tagcaattca cttagctggt	1320
gctggtgaca tggttacgat gattattaac tctgaattgg gattaaatga cattcacttg	1380
gcagaggata ttaagcgcta tccattagct aaagtcgaaa atctattcca aattcgtcat	1440
gaagatggat cgggtacaatt ctttgaagat ccgcttccgt catcattatt tgctcgtgtt	1500
gttgtaatca aaccagatgg gtatgaaccg gttacgggta atccaagcat tgagaagatc	1560
aagctggctc gtcaaagtc taagaagcgg gtatttgtaa ccaatgcatt acgagctctt	1620
aagtacgtca gccgcacagg aaacattcgt gatattccgt ttgttgtaat tgcgggtgga	1680
tctgctcttg actttgaaat accacaactg gtaacagatg agttagcaca ctttaactta	1740
gttgccggac gtgggaatgt tcgtggagta gaagcccccac gaaacgcggt tgcaacagga	1800
ttaattctcc gttatggcga agaaagaaga aagcaatatg aacaatga	1848

<210> 23
 <211> 119
 <212> PRT
 <213> Lactobacillus reuteri

<400> 23

Met Asn Asn Asp Asp Ser Gln Arg Pro Ser Ile Val Val Gly Leu Glu
 1 5 10 15

Asn Gly Ile Thr Ile Pro Asp Ser Val Lys Pro Leu Phe Tyr Gly Ile
 20 25 30

Glu Glu Glu Gln Ile Pro Val Ser Val Arg Lys Ile Asn Ile Asn Asp
 35 40 45

Thr Val Glu Arg Ala Tyr Gln Ser Ala Leu Ala Ser Arg Leu Ser Val
 50 55 60

Gly Ile Ala Phe Glu Gly Asp His Phe Ile Val His Tyr Lys Asn Leu
 65 70 75 80

Lys Glu Asn Gln Pro Leu Phe Asp Met Thr Ile Asn Asp Lys Lys Gln
 85 90 95

Leu Arg Ile Leu Gly Ala Asn Ala Ala Arg Leu Val Lys Gly Ile Pro
 100 105 110

Phe Lys Glu Met Ala Asn Arg
 115

<210> 24
 <211> 360
 <212> DNA
 <213> Lactobacillus reuteri

<400> 24

atgaacaacg atgattcaca acgtccctcg attgtcgtcg gactagaaaa tggaataacg 60
 attccagata gtgtcaagcc acttttttat ggaattgaag aagaacagat cccagtctca 120
 gttcgtaaaa tcaatataaa tgatactgtt gaaagagcat accaatcagc tcttgcac 180

aggctatctg taggaattgc ttttgaagga gatcatttta ttgttcacta taagaactta 240
aaagaaaatc agcctttatt tgatatgaca atcaatgata aaaagcaatt acgaatttta 300
ggagcaaatg cagcgagatt agtaaaagga atccctttta aggaaatggc aaacaggtga 360

<210> 25
<211> 118
<212> PRT
<213> Lactobacillus reuteri

<400> 25

Met Asn Asn Asp Ser Glu Arg Pro Ser Ile Ile Val Gly Val Glu Asn
1 5 10 15

Gly Thr Ala Ile Pro Gln Asn Ala Ala Pro Leu Phe Asn Gly Ile Glu
20 25 30

Glu Glu Gln Ile Pro Val Ala Val Arg Glu Ile Asp Ile Asp Asn Val
35 40 45

Leu Ser Arg Ala Tyr Gln Ser Ala Leu Ala Ser Arg Leu Ser Val Gly
50 55 60

Ile Ala Phe Asp Gly Asp Arg Phe Ile Val His Tyr Lys Asn Leu Lys
65 70 75 80

Glu Asn Lys Pro Leu Phe Asp Lys Thr Ile Ser Asp Gly Lys Gln Leu
85 90 95

Arg Val Leu Gly Ala Asn Ala Ala Arg Leu Val Lys Gly Ile Pro Phe
100 105 110

Lys Glu Met Val Asn Arg
115

<210> 26
<211> 357
<212> DNA

<213> *Lactobacillus reuteri*

<400> 26

atgaacaatg attcagagcg tccctcaatt atcgtagtg ttgagaatgg aacagctatt 60
cctcaaaatg cagcacccgct ttttaacgga attgaagaag aacaaatacc ggtggcggtt 120
agagaaatcg acattgataa tgttttaagt cgggcatacc agtcggccct cgcctcacga 180
ttatcagtag ggattgcttt tgatggtgat cgatttatcg ttactataa aaacttaaaa 240
gaaaacaaac cactatttga taaaacaatt agtgatggta agcaactacg agttctagga 300
gcaaatgcag cgcgactagt aaaggaatc ccccttaagg aaatggtaaa caggtga 357

<210> 27

<211> 37

<212> DNA

<213> Artificial

<220>

<223> primer

<400> 27

atgaaacgtc aaaaacgatt tgaagaacta gaaaaac 37

<210> 28

<211> 32

<212> DNA

<213> Artificial

<220>

<223> primer

<400> 28

ttagttatcg ccccttagct tottacgact tt 32

<210> 29

<211> 30

<212> DNA

<213> Artificial

<220>

<223> primer

<400> 29

atgaaacgtc aaaaacgttt tgaagaacta 30

<210> 30
<211> 25
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 30
ctagttatca cccttgagct tcttt 25

<210> 31
<211> 29
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 31
atgggaggca taattocaat ggaaaaata 29

<210> 32
<211> 31
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 32
ttaacgaatt attgcttcgt aaaccatctt c 31

<210> 33
<211> 21
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 33
atgggaggca taatgccgat g 21

<210> 34
<211> 31
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 34
ttaacgaatt attgcttcgt aaatcatott c 31

<210> 35
<211> 32
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 35
atgaatagac aatttgattt cttaatgcca ag 32

<210> 36
<211> 26
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 36
ttagtagatg ccacgtaag cctttt 26

<210> 37
<211> 33
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 37
atggcaactg aaaaagtaat tgggtttgat att 33

<210> 38
<211> 31

<212> DNA
<213> Artificial

<220>
<223> primer

<400> 38
tcacctgttt gccatttcct taaaaggat t 31

<210> 39
<211> 28
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 39
atggcaactg aaaaagtaat tgggtgtg 28

<210> 40
<211> 26
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 40
tcacctgttt accatttcct taaagg 26

<210> 41
<211> 477
<212> PRT
<213> Lactobacillus reuteri

<400> 41

Met Gln Ile Asn Asp Ile Glu Ser Ala Val Arg Lys Ile Leu Ala Glu
1 5 10 15

Glu Leu Asp Asn Ala Ser Ser Ser Ser Ala Asn Val Ala Ala Thr Thr
20 25 30

Asp Asn Gly His Arg Gly Ile Phe Thr Asn Val Asn Asp Ala Ile Ala

35	40	45
Ala Ala Lys Ala Ala Gln Glu Ile Tyr Arg Asp Lys Pro Ile Ala Val		
50	55	60
Arg Gln Gln Val Ile Asp Ala Ile Lys Glu Gly Phe Arg Pro Tyr Ile		
65	70	75 80
Glu Lys Met Ala Lys Asp Ile Lys Glu Glu Thr Gly Met Gly Thr Val		
	85	90 95
Glu Ala Lys Ile Ala Lys Leu Asn Asn Ala Leu Tyr Asn Thr Pro Gly		
	100	105 110
Pro Glu Ile Leu Glu Pro Val Val Glu Asn Gly Asp Gly Gly Met Val		
	115	120 125
Met Tyr Glu Arg Leu Pro Tyr Gly Val Ile Gly Ala Val Gly Pro Ser		
	130	135 140
Thr Asn Pro Ser Glu Thr Val Ile Ala Asn Ala Ile Met Met Leu Ala		
	145	150 155 160
Gly Gly Asn Thr Leu Tyr Phe Gly Ala His Pro Gly Ala Lys Asn Val		
	165	170 175
Thr Arg Trp Thr Ile Glu Lys Met Asn Asp Phe Ile Ala Asp Ala Thr		
	180	185 190
Gly Leu His Asn Leu Val Val Ser Ile Glu Thr Pro Thr Ile Glu Ser		
	195	200 205
Val Gln Gln Met Met Lys His Pro Asp Ile Ala Met Leu Ala Val Thr		
	210	215 220
Gly Gly Pro Ala Val Val His Gln Ala Met Thr Ser Gly Lys Lys Ala		
	225	230 235 240

Val Gly Ala Gly Pro Gly Asn Pro Pro Ala Met Val Asp Ala Thr Ala
245 250 255

Asp Ile Asp Leu Ala Ala His Asn Ile Ile Thr Ser Ala Ser Phe Asp
260 265 270

Asn Asp Ile Leu Cys Thr Ala Glu Lys Glu Val Val Ala Glu Ser Ser
275 280 285

Ile Lys Asp Glu Leu Ile Arg Lys Met Gln Asp Glu Gly Ala Phe Val
290 295 300

Val Asn Arg Glu Gln Ala Asp Lys Leu Ala Asp Met Cys Ile Gln Glu
305 310 315 320

Asn Gly Ala Pro Asp Arg Lys Phe Val Gly Lys Asp Ala Thr Tyr Ile
325 330 335

Leu Asp Gln Ala Asn Ile Pro Tyr Thr Gly His Pro Val Glu Ile Ile
340 345 350

Cys Glu Leu Pro Lys Glu His Pro Leu Val Met Thr Glu Met Leu Met
355 360 365

Pro Ile Leu Pro Val Val Ser Cys Pro Thr Phe Asp Asp Val Leu Lys
370 375 380

Thr Ala Val Glu Val Glu Lys Gly Asn His His Thr Ala Thr Ile His
385 390 395 400

Ser Asn Asn Leu Lys His Ile Asn Asn Ala Ala His Arg Met Gln Cys
405 410 415

Ser Ile Phe Val Val Asn Gly Pro Ser Tyr Val Gly Thr Gly Val Ala
420 425 430

Asp Asn Gly Ala His Ser Gly Ala Ser Ala Leu Thr Ile Ala Thr Pro

435

440

445

Thr Gly Glu Gly Thr Cys Thr Ala Arg Thr Phe Thr Arg Arg Val Arg
 450 455 460

Leu Asn Ser Pro Gln Gly Phe Ser Val Arg Asn Trp Tyr
 465 470 475

<210> 42
 <211> 1434
 <212> DNA
 <213> *Lactobacillus reuteri*

<400> 42
 atgcagatta atgatattga aagtgtgtga cgcaaaattc ttgccgaaga actagataat 60
 gccagctctt caagtgcaaa cgttgcagct actactgata atggatcatg cggaattttc 120
 actaatgtca atgatgcaat tgctgtgtga aaagctgtc aagaaatata tcgggataag 180
 ccaattgtg ttgccaca agtgattgat gccattaagg aaggattccg cccatatatt 240
 gaaaaaatgg ctaaagatat caaagaagaa acaggaatgg gaacagtaga ggccaaaatt 300
 gctaagttaa acaatgcctt gtacaacact cctgggtccg agattcttga accagttgta 360
 gaaaacggtg acggtgggat ggttatgtat gaacggttac catatggtgt tattggtgcg 420
 gttggcccaa gtacaaacc ttccagaaact gtaattgcta atgcgatcat gatgcttgcc 480
 ggtggttaata ctctttactt tgggtgtcac cctggcgcaa agaattgtac togctggaca 540
 attgaaaaga tgaacgattt tattgcagat gcaacaggcc ttcataattt agttgtaagt 600
 attgaaacac caacaattga atcagttcaa caaatgatga agcaccocga cattgcaatg 660
 ttagcagtaa ctggtggccc agctgttgtt caccaagcaa tgaccagtgg taagaaagcg 720
 gttggtgtg gtctgtgtaa tcctcctgca atggttgatg ctactgtga tattgattta 780
 gctgtcata atatcattac atctgcttca ttgataatg atattttatg tactgtgaa 840
 aaggaagtag ttgcagaaag tagcattaaa gatgaattaa ttcgtaagat gcaagatgaa 900
 ggtgcctttg tagttaaccg tgaacaagcc gataaattag ctgatatgtg tatccaagaa 960
 aatggtgtc ctgatcgtaa atttgttggt aaggatgcaa cttatatctt agaccaagct 1020

aatattcctt acacaggcca ccagttgaa attatttgat aatttcctaa ggaacatcca 1080
 ttagtaatga ctgaaatgtt aatgccaatt ttaccagttg tttcttgccc aacatttgat 1140
 gatgttttga agactgctgt tgaagttgaa aaaggtaacc atcacacagc tactattcat 1200
 tccaataacc ttaagcatat taataatgct gtcaccgga tgcaatgttc aatctttgtt 1260
 gttaatggcc catcctatgt tggtagaggt gttgcagata atggagctca ctcaggtgct 1320
 tcagcattaa caattgctac gccaaactggt gaaggaacat gtactgcacg aacatttact 1380
 cgtcgggttc gtttgaactc accacaagga ttctcagtac gtaactggta ttaa 1434

<210> 43
 <211> 395
 <212> PRT
 <213> Lactobacillus reuteri

<400> 43

Met Met Ser Lys Lys Ile Leu Ala Ile Asn Ser Gly Ser Ser Ser Ile
 1 5 10 15

Lys Phe Lys Leu Tyr Leu Met Pro Glu Glu Lys Leu Leu Ile Ser Gly
 20 25 30

Ser Ala Glu Asn Leu Gly Ser Ser Thr Ser Gln Leu Ser Tyr Lys Thr
 35 40 45

Asp Lys Thr Asn Glu Thr Arg Gln Ile Pro Leu Lys Asn His Ser Glu
 50 55 60

Ala Ile Asp His Ile Ile Asp Val Leu Met Ser Ser Gly Val Val Lys
 65 70 75 80

Asp Lys Ser Glu Ile Tyr Gly Val Gly His Arg Ile Ser His Gly Gly
 85 90 95

Ser Tyr Tyr Thr His Ala Val Ala Val Thr Pro Glu Val Glu Lys Arg
 100 105 110

Ile Asp Glu Leu Lys Val Leu Ser Pro Leu His Asn Pro Asn Gly Leu
115 120 125

Ala Gly Ile Lys Ala Phe Glu Lys Phe Leu Pro Asp Ala Lys Glu Val
130 135 140

Val Thr Phe Asp Asn Ser Phe His His Thr Ile Pro Lys Lys Ala Tyr
145 150 155 160

Met Tyr Ala Leu Pro Tyr Glu Phe Tyr Glu Lys Tyr Gln Ile Arg Arg
165 170 175

Tyr Gly Phe His Ala Pro Ser His Gln Tyr Val Ser Glu Lys Ala Arg
180 185 190

Glu Leu Phe Gly Lys Glu Lys Thr Arg Arg Met Ile Thr Cys His Leu
195 200 205

Gly Asn Gly Ser Ser Val Ser Ala Ile Leu Asp Gly Lys Ser Val Asn
210 215 220

Ser Ser Met Gly Phe Thr Pro Leu Ala Gly Val Val Met Gly Thr Arg
225 230 235 240

Cys Gly Asp Ile Asp Pro Glu Ile Ile Pro Phe Leu Glu Glu Glu Leu
245 250 255

Asn Ile Asp Ser His Glu Met Arg Arg Ile Met Asn Glu Asp Ser Gly
260 265 270

Leu Lys Gly Leu Ser Gly Ile Ser Asn Asp Glu Arg Glu Ile Glu Ser
275 280 285

Ala Ala Lys Asn Gly Asn Glu Arg Ala Gln Leu Ala Leu Asp Val Phe
290 295 300

Val His Ser Ile Gln Gln Tyr Ile Gly Ala Tyr Thr Thr Asp Leu Asp

305 310 315 320
 Gly Leu Asp Thr Leu Val Phe Thr Ala Gly Ile Gly Glu His Ala Ala
 325 330 335
 Tyr Ile Arg Ser Gln Ile Cys Lys Asn Leu Asp Tyr Leu Gly Val Lys
 340 345 350
 Ile Asp Glu Glu Lys Asn Lys Asn Asn Glu Leu Ser Ile Glu Ala Pro
 355 360 365
 Asp Ser Lys Val Lys Ile Ala Val Ile Pro Thr Asn Glu Glu Ile Ile
 370 375 380
 Ile Ala Arg Asp Val Met Asn Val Thr Gln Gln
 385 390 395

<210> 44
 <211> 1188
 <212> DNA
 <213> Lactobacillus reuteri

<400> 44
 ttgatgtcaa aaaaaatact tgcaattaat tctggttagtt catcaattaa gttcaaactt 60
 tacttgatgc cagaggagaa actattaatt agtggttctg ctgaaaatct tggttcttcg 120
 acaagtcagc ttcatataaa aactgataaa actaacgaga caagacaaat ccctttaaaa 180
 aaccactcag aggcaattga ccatattatt gatgttttaa tgtctagtgg ggttgtttaag 240
 gataagtcag aaatttatgg tgttggtcac cggatttctc atggcggaag ttactatact 300
 catgcagtgg cagtcactcc agaagttgaa aaacggattg atgaattgaa ggtgttatca 360
 cctctgcata atccaaatgg actagcaggg ataaaagcct ttgaaaagtt tcttccagat 420
 gccaaaggaag tagttacttt cgataattca ttcatcata caatccctaa gaaagcttat 480
 atgtatgctt tgccatatga gttttatgaa aagtatcaaa ttaggcgcta cgggttccat 540
 gcccttcac atcagtatgt gtcagaaaaa gcgcgtgaac tttttggtaa agaaaagact 600
 cgtcgtatga tcacgigtca tttgggaaat ggatcaagcg tttcggcgat cttagatgga 660

aagtcgggta actcttcaat gggctttact cggtagcag gtgtagtgat gggaacgcga	720
tgtggagata ttgatccaga aattattcct tttcttgaag aagaactcaa tattgattca	780
catgaaatgc gtcgaataat gaatgaagac tcagggccta aaggcttata tgggatttct	840
aatgatgaac gtgagattga aagtgcggct aaaaacggta acgaacgggc acaattagct	900
ttagatgtat ttgtacattc aattcaacaa tatattggag catatacaac ggatcttgat	960
ggattggata cattagtatt tacagccgga attggtgaac atgctgctta tattagaagt	1020
cagatctgta agaatttaga ctatcttga gtcaaaattg acgaagagaa aaataaaaaat	1080
aatgagctaa gcattgaagc acctgatagt aaggttaaaa tagctgttat tccaactaac	1140
gaagaaataa ttattgcccg tgatgtaatg aatgtaactc agcaataa	1188

<210> 45
 <211> 1122
 <212> DNA
 <213> *Lactobacillus reuteri*

<400> 45	
atggttgaag aatttggctc accatcgtct tacatccaag gaaaagggtg ctttttgaa	60
agtataagt atcttaaaaa ctttggcaca aaaccgttat tattggctgg cgaaacagtc	120
tataaaattg taggtaagcg ttttgaacag tatcttcaag aaagtggta tgatgtcacc	180
ogtgttcaat ttaatggtag atcatccact aacgaagtaa accgggttac agaaattggt	240
aaagaaaata atgtaactgt cgtttatggt ctiggtgggtg gtaaaacagt tgataccgcc	300
aaagcaattg ccgacaatct ccatctacca gtigttaatta tgccaacatt ggcttcaaat	360
gatgcacctt gttctogtct ttcagtaatc tacactgatg acggtggctt cgatcattat	420
ogtttctaca accaaaaccc taatctggtt ttagttgata ctcaagttat cgctaattgt	480
cccgttcgga tgcttatttc tggaattgct gatgctttag ctaccaatgt tgaggcacia	540
gcagttgctc aagctcatag tgatacaatg ctiggtgaaa aacaaaccct tgttggaat	600
gcaatcgccc agaaatgtga agagacatta tttaattact cgcacctagc ttagctgat	660
gcagaaaccc atgtcgttac accagcattt tctaatttg ttgaagcaaa tacactaatg	720

agcggctctcg gttttgaaag tgggtggtcta tctggtgccc acgctattca tgatggctta	780
acaatttttag aagagactca tgatttaaca cacggtgaaa aggtcgcata cggtagctta	840
acacaattaa tgttgaagg cgctgaccag gaacgtata acaagtactt ccaattttatt	900
ctttcttttag gcctaccaac tactcttgct gatctacatt tagaaaatgt caccgatgaa	960
gaactgctca atgctggaag agcgccttgt tcagaacaag ataccatgga tcgtttgcca	1020
tttaaggtaa ctccagatga cgttgctcaa gcattacgag cagttgatgc atatactaaa	1080
caatatttaa ctaatcatcg ttgtcaccat agtcgtatgt aa	1122

<210> 46
 <211> 1021
 <212> DNA
 <213> Artificial

<220>
 <223> recombinant DNA

<400> 46	
gataagacgg ttcgtgttcg tgctgacttg caccatatca taaaaatcga aacagcaaag	60
aatggcggaa acgtaaaaga agttatggaa ataagactta gaagcaaact taagagtgtg	120
ttgatagtgc agtatcttaa aattttgtat aataggaatt gaagttaaatt tagatgctaa	180
aaattttgtaa ttaagaagga gtgattacat gaacaaaaat ataaaatatt ctcaaaactt	240
tttaacgagt gaaaagtac tcaaccaaatt aataaaacaa ttgaatttaa aagaaaccga	300
taccgtttac gaaattggaa caggtaaagg gcatttaacg acgaaactgg ctaaaataag	360
taaacaggta acgtctatig aattagacag tcatctattc aacttatcgt cagaaaaatt	420
aaaactgaat actcgtgtca ctttaattca ccaagatatt ctacagtttc aattccctaa	480
caaacagagg tataaaattg ttgggagtat tccttaccat ttaagcacac aaattattaa	540
aaaagtggtt ttgaaagcc atgcgtctga catctatctg attgttgaag aaggattcta	600
caagcgtacc ttgatattc accgaacact agggttgctc ttgcacactc aagtctcgat	660
tcagcaattg cttaagctgc cagcggaatg ctttcatcct aaacaaaaag taaacagtgt	720
cttaataaaa cttaccggcc ataccacaga tgttccagat aaatattgga agctatatac	780

gtactttgtt tcaaaatggg tcaatcgaga atatcgtaa ctgtttacta aaaatcagtt 840
tcatcaagca atgaaacacg ccaaagtaaa caatttaagt accgttactt atgagcaagt 900
attgtctatt tttaatagtt atctattatt taacgggagg aaataattct atgagtcgct 960
tttgtaaatt tggaaagtta cacgttacta aagggaatgt agataaatta ttaggtatac 1020
t 1021

<210> 47
<211> 30
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 47
atgcagatta atgatattga aagtgcgtga 30

<210> 48
<211> 27
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 48
ttaataccag ttacgtactg agaatcc 27

<210> 49
<211> 34
<212> DNA
<213> Artificial

<220>
<223> primer

<400> 49
ttgatgtcaa aaaaaatact tgcaattaat totg 34

<210> 50
<211> 29
<212> DNA

<213> Artificial

<220>

<223> primer

<400> 50

ttattgctga gttacattca ttacatcac

29

<210> 51

<211> 23

<212> DNA

<213> Artificial

<220>

<223> primer

<400> 51

atggttgaag aatttgctc acc

23

<210> 52

<211> 24

<212> DNA

<213> Artificial

<220>

<223> primer

<400> 52

ttacatacga ctatggtgac aacg

24

<210> 53

<211> 19860

<212> DNA

<213> Lactobacillus reuteri

<400> 53

tttttgtgta ttaatttgta aaatattgcc gttattgaac agttaatcca ataaagacaa

60

taaaatacat aattaatgtg ttagcattat atgtatagaa aacgcataca atttgggaat

120

aatataaaaa gggttggtgtt tagacatgca tggatttatt ggcgaatttt ttggcaccat

180

ggttttaatc ctattaggag caggatgttg tgctggtaat agtttgaata aaacatatgg

240

gaaacaaagt ggctgggtgtt ttatctgtat ttcatggggc ttagcagtta caatgggagt

300

ttatgttgca ggatttctgg gttcattagg gcacttaaata cccgctgtaa caattccttt

360

tgctattttt ggcttattcc catggagtaa cgttatacct tacttacttg gtcaattttct	420
tggatgcgttt gttgggtgcag tattagtaat tattcaattc tatccacaat ttaaagcaac	480
cccaaatgaa gaagaaggaa ataatgttgg tatttttgct actcgtccag cgataaatag	540
tccaattttt aactttttct cagaagtgat tgcgaccttt gcattttatt tcatcttatt	600
aaatcttggc aactttacac agggattgaa gccatttatt gtaggaatgg ttattgcagt	660
tgttgggtaca tgtctcggga caactactgg ctttgcatta aaccagctc gtgattggtc	720
accacgttta gcataacta ttttgccaat tcctaataag ggtgtttcag aatgggtgta	780
tgcattgggtt ccaatgtgtg gcccaattgt tgggggcctt cttgcttgtg ctttacaac	840
ggcactagtt tagtgaacct agagaaaagg aggcataatta atatagcctc tttatttagt	900
ttaaataaaa tatgaaatat ctctagtagg aaaattaatg aaaaaagaat ttttaaaaag	960
tagtaatgaa caattaaaaa aattttccga gattgttaat ggggataagc ctttacgtaa	1020
agttacggct gatgaaaagc taaaggtcgg ttagatttta ggaacttctt caattgtttt	1080
aacagtgtcg gattccaaag ataagattgt atacggagcg tatgaatatg accatgcagt	1140
tcaagatggt attgtagtta atttcattga atcagttaat attttaagac gcttaaaaga	1200
aaaagctgag aaagtattag gacgtgaact taaaacggca tgtgggtgcta ttccaccgaa	1260
gacaggagag aagagtgcc aagtgggtgc taatgttatt gaagagacag gcttgctttg	1320
tacagtggtt gaagatgaac cgacagcagc tgcgaagtgc ttaagattgt caaatggtac	1380
agttgtagat attggaggag gaacaactgg gattagtatt tttaaagata acaagctcat	1440
ccatgttatt gatgaagcaa caggcggatt tcatatgacg cttgttcttg gaggaagata	1500
taaaataaaa aatgatgaag cagaaaaatt aaagcgtaac aagaataaag aatctgaagt	1560
atatgctgtt attaaacctg tagttgagaa aatggcagca attgttcaaa atatgggagt	1620
agaaattatt gatccagtaa tagtgggtgg aggtgcaact aactttactg aatttacaac	1680
aacctttagt aaagatttaa agcgtaaagt ttataaacgc ctttatcctc aatttggtac	1740
gccactaggg attgcaatgt ttgatgatta gaataaataa gaggctgggc accccaacc	1800
tccttttaat ttttaataat tttttcagta taaatccatt gaattactga acgatcaaat	1860

acattaatct cactagctgg aataataggt tgagaacaat ctactgtata gacccaacct	1920
gctttattac taacatcatt cagatcattt attgaataga tatatggata ccattttaa	1980
tcacgggctt taaaggaaat atcattttta ttgaaaaaat cttttgagat ttcataaacg	2040
gacttatttg agcgccattg taaatctctt ggaatagtat agattttctt tattgoggaa	2100
ttatatatttc gatactttga tgggtgcatt cctacttttt gcttgaaaat tttagtaaag	2160
taacttgtct gtgaaaaacc aacttgatga gccattttat taattgggtg atttgaaaaa	2220
attaattttt cttgagcaag tgcaattttt tgtagattta tatagttaat aaaattgtca	2280
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<210> 54
 <211> 708
 <212> DNA
 <213> *Lactobacillus reuteri*

<400> 54
 atgcatggat ttattggcga attttttggc accatggttt taatcctatt aggagcagga 60
 tgttgtgctg gtaatagttt gaataaaaca tatgggaaac aaagtggctg gtggtttatc 120
 tgtatttcat ggggcttagc agttacaatg ggagtttatg ttgcaggatt tctgggttca 180
 ttagggcact taaatccgcg tgtaacaatt ccttttgcta tttttggctt attcccatgg 240
 agtaacgtta taccttactt acttgggtcaa tttcttgggtg cgtttgttgg tgcagtatta 300
 gtaattattc aattctatcc acaatttaaa gcaaccccaa atgaagaaga aggaaataat 360
 gttaggtattt ttgctactcg tccagcgata aatagtccaa tttttaactt tttctcagaa 420
 gtgattgcga cctttgcatt tattttcatc ttattaaatc ttggcaactt tacacagga 480
 ttgaagccat ttatcgtagg aatggttatt gcagttgttg gtacatgtct cgggacaact 540
 actggctttg cattaaacc agctcgtgat tggtcaccac gtttagcata tactattttg 600
 ccaattccta ataagggtgt ttcagaatgg tggatgcat gggttccaat gtgtggccca 660
 attgttgggg gccttcttgc ttgtgcttta caaacggcac tagtttag 708

<210> 55
 <211> 834
 <212> DNA
 <213> *Lactobacillus reuteri*

<400> 55
 atgaaaaaag aattttttaa aagtagtaat gaacaattaa aaaaattttc cgagattgtt 60
 aatggggata agccttttac taaagttacg gctgatgaaa agctaaaggt cgggtgtagat 120
 ttaggaactt cttcaattgt ttttaacagt ctggattcca aagataagat tgtatacgga 180
 gcgtatgaat atgaccatgc agttcaagat ggtattgtag ttaatttcat ggaatcagtt 240
 aatattttta gacgctttaa agaaaaagct gagaaagtat taggacgtga acttaaaacg 300
 gcatgtggtg ctattccacc gaagacagga gagaagagtg ccaaagtggg tgctaattgtt 360

atcgaagaga caggcttgct ttgtacaggt gttgaagatg aaccgacagc agctgcgaag	420
ttcttaagat tgtcaaatgg tacagttgta gatattggag gaggaacaac tgggattagt	480
atttttaag ataacaagct catccatgtt attgatgaag caacaggcgg atttcatatg	540
acgcttgctt ttggaggaag atataaaata aaaaatgatg aagcagaaaa attaaagcgt	600
aacaagaata aagaatctga agtatatgct gttattaaac ctgtagttga gaaaatggca	660
gcaattgttc aaaatatggg agtagaaatt attgatccag taatagtgtt gggagggtgca	720
actaacttta ctgaatttac aacaaccttt agtaaagatt taaagcgtaa agtttataaa	780
ccgctttatc ctcaatttgt tacgccacta gggattgcaa tgtttgatga ttag	834

<210> 56
 <211> 1080
 <212> DNA
 <213> *Lactobacillus reuteri*

<400> 56	
atgtacgaat attcttcaaa attcttgaat gacattcaaa aggtaacaaa aacatttcag	60
gaaataacca ataataatat aattttcaca agcattaccg gagcaattgt tgattgcaac	120
acccttcttt ttgactcaaa tatttcactt gaacatttac gaaaactcga ttttaaaaat	180
tactttgttt ttccactagt tataagctca tctttaagtg gtttctttgt tcttgatgaa	240
tcacatatag aatcagacgc tattgattta tgtagtaa atattgaaat ttcttgcaaa	300
aattttattg acagttccaa tgactgcata gctgtcctta cccattcga ggctcctaag	360
ctaagttcac taatcaaagt ccttaatggg attttgaata tttctggaga tgattcaata	420
gctaacgtta ctaatcctcc tattcttaat aacagaaatg atggtactct aagtgatatt	480
gaaaaaaata taaccatggc gcttaaatatc attaatcca atttagaaaa atcgcttact	540
ttagaaaacg tttctcaaag gatttatctc tcaccatcat acttaagtcg aatctttaaa	600
aattatttta atgacaattt tattaactat ataaatctac aaaaaattgc acttgctcaa	660
gaaaaattaa ttttttcaaa tacaccaatt aataaattgg ctcatcaagt tggtttttca	720
cagacaagtt actttactaa aattttcaag caaaaagtag gaatgacacc atcaaagtat	780

cgaaaatata attccgcaat aaagaaaatc tatactattc caagagattt acaatggcgc	840
tcaaataagt ccgtttatga aatctcaaaa gattttttca ataaaaatga tatttccttt	900
aaagcccgtg atttaaatgg gtatccatat atctattcaa taaatgatct gaatgatgtt	960
agtaataaag caggttgggt ctatacagta gattgttctc aacctattat tccagctagt	1020
gagattaatg tatttgatcg ttcagtaatt caatggattt atactgaaaa aattatttaa	1080

<210> 57
 <211> 282
 <212> DNA
 <213> Lactobacillus reuteri

<400> 57	
atgggacaag aagcacttgg ttttaattgaa accgaaggac ttgtagcttc aattgaagct	60
gctgatgcaa tggtaaaagc tgctaattgt aaattaattg gtcaagaaaa gattggtcac	120
ggattagtca cagtaatggg tcgtgggtgat gttggagctg ttaaggcttc agttgatgcc	180
ggagtacaag ctgccgaaaa tattggagaa gttgtttcga gttacgtaat tcctcgtcct	240
caatctgaag ttgataagct cttaccgcat catggagaat aa	282

<210> 58
 <211> 717
 <212> DNA
 <213> Lactobacillus reuteri

<400> 58	
atgaatgatt ttctgaattc tactagtact gttccagaat ttgttggtgc tagcgaaatt	60
ggagatacca ttggaatggg aattccgaga gttgatcaac aactattaga taaattacac	120
gttacaaaac aatacaagac tttaggtatt ttgagtgcac gtactgggtc tggtcacaaa	180
attatggcaa tggatgaagg aattaaggct actaacatgg aatgtattga tgttgaatgg	240
ccacgtgata ctaaagggtg aggaggccat ggatgtttta ttatcatcgg tggatgatgat	300
cctgcagatg caccgcaagc tattcgggtt gcacttgata atcttcacgc tacatttggg	360
gacgtttata acgccaagc gggtcacctt gaattacaat ttacagctcg tgctgcagg	420
gctgcacatc ttggattagg tgcagttgaa gggaaagcat ttgggttgat ttgtggttgt	480

ccttccggga ttggtgtcgt gatgggagat aaggctttaa agactgctgg tgttgaaccg 540
 cttaacttta cttcaccaag tcatggtaca agtttctcta acgaaggttg cctaactatt 600
 accggtgact caggagctgt tcgtcaagct gttatggctg gacgtgaagt aggattaaag 660
 ttattgtcac agtttgggtga agaaccagtt aatgatttcc catcatacat taagtag 717

<210> 59
 <211> 570
 <212> DNA
 <213> Lactobacillus reuteri

<400> 59
 atgaagtctt tgggctatgt agaatgtaat ggattatctg gcgctattgt ggctgctgac 60
 aggatgctaa aaactgcaga tgttgaactt agtagtattc aaaatacgaa aggtaatgga 120
 tgggtcacct tacaagtttc tgggtgaacta tcagctataa ctgttgcggt tcaagctgta 180
 aaagactatt tacctgatgt atatgtaacg tcagcgataa tagggcgctcc agcaataggg 240
 ttgaactcct tgggcaaaac agatttattg caaccaaatc cagaaaagca gcaaaatatt 300
 gctgaaaagg aaaagggttc tgaaccatct tcaattaaag aagagatagt acagaatagt 360
 gaaaattctg ctgaacctag tgttcaaact gagcgatcat tagagggcaa agatgaaatc 420
 gaagcttcgg attcgtctaa tgataaacia gataccaact ctaatgataa tgaagtcaca 480
 tgcaatatgt gtggagatcc aaaatgtcca cggaaattag gagaaccgca taagaagtgt 540
 atccattaca atgaattaaa gaaaaagtag 570

<210> 60
 <211> 291
 <212> DNA
 <213> Lactobacillus reuteri

<400> 60
 atgaataacg ctttaggaat gattgaaaca cgcggattag ttgcatctat tgaagctgct 60
 gatcaaatgg taaaggctgc taatgtaaca ttaactggcc aagaaaagat tggtagtgga 120
 ttggtaaactg ttatgattcg tggatgattt ggtgctgtaa aggctgcggt tgatgctggt 180
 gtacaagctg ctgaagggtg cggcgaagtt gtatcgtctt acgtaattcc tcgtccacat 240

gaagaagttg aaaagatttt accaggtgga tcagattcag acgtgaata g 291

<210> 61

<211> 645

<212> DNA

<213> Lactobacillus reuteri

<400> 61

atggatgaag aacatttaag aacacttata cggacgattg ttagagaaac acttaatcct 60

aacctagttc caattggtgt ttcaaatcac catgtacatt tgacggaaga agactttcaa 120

aagctattcc ctggtcaaaa gattgaaatg ctaaagaaac ttctgtcaaca tgcggacttt 180

gctgcaaagc aaactgttga tctgatcggg cccaaaggca ccattgaaca tgttcgtcta 240

atggggccat accgttcaca ctacacagta gaaattgccc gttcagaaaa ctttacta 300

ggaattgatg ctccaattag aatgtctggt gatcttgatg gcaccccttc aattaagggt 360

cggtcacat atgcggaaat tgaaattcaa ggtgtaattg ttgcaaagcg acacatccac 420

atgagtttag aagatgcaa gcgctttggc gtaaagctcg gtgattcaat gcaggttgaa 480

gtagatggcg atggtggacg taaaaccatt ttgatgacg tagttgctcg ccctcgtgaa 540

gactttgtcc ttgaaatgca tattgatact gatgaagcca atgcagctaa tgtcggacta 600

ggaataaatt ctttcggaaa agttattatc aagaagaaaa actaa 645

<210> 62

<211> 504

<212> DNA

<213> Lactobacillus reuteri

<400> 62

atggataacc tagtacaaca ggttatgcaa cgattagaag aacgaaagca tacgagcgtt 60

gaagttactt ttaatcatca agttgccccg cctagtgaac agatTTTTTT gagaaacgga 120

aaagttattc taaaagatat ttcgattgag ttaataacgg acttatattc aatggaaaag 180

actaacgctt gggttaaatg ggtgtagaa ggaattagct atgatgttaa attttacttt 240

ttaattaatg aacagatggt taattttatt ccacggatga tgattttgga ctggccgatc 300

ttgtttgttg taaataacga atgccagta attgccagtt ataacggat tattaccaga 360

gaagagatag ctgctaaacc agataaatcg attcttgta gatatcaaaa gcaacatatt	420
acagatgaag cacttgatat ctgtaactat aaaaaatta aaataaagat taggactgaa	480
gaaaattgta tatggcgaga gtag	504

<210> 63
 <211> 273
 <212> DNA
 <213> *Lactobacillus reuteri*

<400> 63	
atggcgagag tagtaggtag tggttgca acccaaaagg atccatcctt agttggaaag	60
aaactaatga tagttcaaca gattaattcc gaccaacaac cagttcgatt tgaacaagtt	120
gccgtgata cagtaaatgc tgggattggt gataatgtat taatagttcg tggtgctggt	180
gcaagacgtg ctgataaaga gcgtgatgag gatcaagtaa gggacgttaa tgactgtacg	240
atagttggaa taattgaccg ttttgataag tag	273

<210> 64
 <211> 609
 <212> DNA
 <213> *Lactobacillus reuteri*

<400> 64	
gtgtgcattg gaggcacaa aatggctatt tacacaaaag gtggtgacaa gggagaaaca	60
agtttattcg atggaacgag ggtacctaag gattcattac gagttgaaac ttatggaact	120
tttgatgaat taaacgctaa tattagtttg gcagataaat tctgtgaaag taaacgtaat	180
aagaagcttt tacaagagat cgaatataaa atgtttttcc ttcaaggiga gatagcgaca	240
gaaaaacggc agtatattiac tgataaaagt aagattatta ctgatgaaga tactcgaaaa	300
cttgaaaagg ttattgatga atatacatca aaactgccac ctgttcacatg ttttatotta	360
cctggttcga gtactcgggg tgcacaactt catatttctg gaacaatctg tcgtcgtgca	420
gagcgactat ttgtcggct atcaaagaat gtaaaatttc gtccagagct agaaagatat	480
attaatcgtt tgtcggattt tttatatatt gtagcgcgtg atgaagacta tgaagattta	540
ttaaatagtg taactgatga cgtgttaaaa atttacaac gttatcaaga agaaaaggat	600

gtgcgttaa 609

<210> 65
<211> 474
<212> DNA
<213> Lactobacillus reuteri

<400> 65
atgaacgagg aacaaattag taagattgtt gaaaacgtaa tcaagaataa tgcttctaaa 60
aatctatttg atcggcacaa aatggaaaaa gtaatcgatg cggctgtagc tcgtgctaata 120
gaattgggtg ttggagtaac aattgctatt atgaaagctg atcaagtatt gcaaatgagc 180
taccatatgc caaatgctaa tttagtaagt tgtacttttag ctccataaaaa ggcatggtca 240
gcattagcaa tgaaggaacc taccaaggat attagtaagg atatccaacc aggtgocgga 300
ttatatcaaa tggaaacaat gcttgatggt aagttagcat cttttgcagg tggatttcca 360
ttgaagatta acgatgaaat tattggagcg attggtgtta gtggtggatt ggttgaagaa 420
gatcaatcaa tttgtgaagc tgctgttgca gaatTTTTga aggagagtaa gtag 474

<210> 66
<211> 348
<212> DNA
<213> Lactobacillus reuteri

<400> 66
atggctaggc aggatatcaa acggacaatt caagaatatg ttccgggtaa acagtaaca 60
ttagcacata tcgttgctaa ccctacgcca gacatttatg agaaattagg gatacaaaact 120
cctaaaaatg cgcttggtat ttigacaata acgccaagtg aagcctcaat tatcgtggtg 180
gatattgcta caaagtogag taatgttact ctagggttca ttgatcgatt tagtggctcg 240
gttgtaattg tgggagaagt ttctgaaatt gaatcagctt tgcgtcatgt ggttgataag 300
ctacaaacgt tactgggggtt tgatgttccct gaaattacac gaacataa 348

<210> 67
<211> 795
<212> DNA
<213> Lactobacillus reuteri

<400> 67

atggcgaatc atcagcgaat tctagcggtt gaaaatggat ttaattttcg agatcttgg	60
ggttatagaa ctattgatgg cgaagtctg aaatggaata atcttggttcg ttctgcgc	120
ctctcctatt ttacacataa tgagcaaaga aaactttatg gatatggat taggacaatt	180
attgacttgc gttcaacttc cgaagtagct ttttatcccg accaattaac atcattgatg	240
aattatattc ggataccggt ctttgagaat gaccttactg aaagtaatat tagtattgct	300
gaagcacgaa aaagtttttc aaaggatcca caagcgggtt ttaatcgcat gatggaagta	360
tattgtcaat ttgtcactga tgagaaagca caagaagcat ttcacacctt tattaataaa	420
ttatgcctac attcagcgca ggggtggtgtt ttatttcatt gctctgcggg gaaagaccgt	480
actggtttag gagcaattta ttactaagt cttctacaag ttccagtaga tataatttat	540
caagattata ttttaactaa taaagcatca acaaaaagga taaaagaacg attacgttat	600
gctataaaaa ataacctagg tgataattat cttcactcaa tttacgatct ttcaacagca	660
aatagggtgtt attatgatca agcaatctct cttattaata ataatatgg tggaatgacc	720
tcttacttaa aagatgtgtt acaaatcagt gattcaatgg ttgaacaact aagatactta	780
tatctgacaa agtga	795

<210> 68

<211> 321

<212> DNA

<213> *Lactobacillus reuteri*

<400> 68

atgtattttg atgttgaaac gaatgacgtg cgaccacatt caattttgat aaatcaaggc	60
gaaaactttg aacatgctcg tgcacgaata tggtcatttt tattggatac ttcttataag	120
tatccacaac aaaatatattt aataattaca catggctgga taataaaaaa tatcatttcg	180
ttgtgtcttg agaatatgga tgggacttca ttcaaaaatc ccaataatct aagtattagt	240
aagatccaat tgaatcgggc attaaagcag caacgaatat gttattataa tcgaccgttc	300
atagggacga tgatattatg a	321

<210> 69

<211> 558
 <212> DNA
 <213> Lactobacillus reuteri

<400> 69
 atgagtctta ttacaattct ttgatattt gtgggactta atattgatac gtttattgca 60
 ctattatttc ttttaacgaaa ctataattac cggttaccga ttattggctt tggagtagca 120
 acgcttattt tatggatctt tggggtaatt ttaggaaaag ggctagcatt tctatttcca 180
 gattggatta caggatttat gggcattatt ttaatcttta tagcgctttt tgaacaggat 240
 gacgaaaaaa agacaactaa tacaagtttt ctctcattac ttctgttttg tttaagcctt 300
 ggtggagata atcttgctgt ttatattcca ttggtggta acctagttg gagtacagatt 360
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 <213> Artificial

<220>
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<210> 72
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<220>
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<400> 72
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<220>
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<220>
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<220>
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